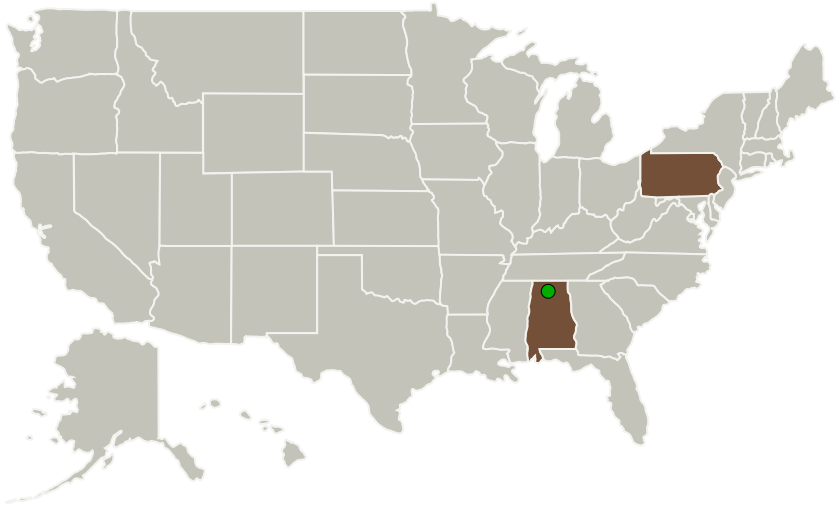
Low Mass, Two-Phase Thermal Switch, Phase I

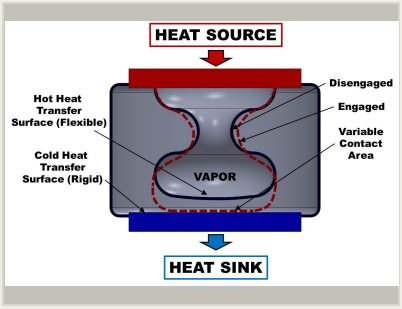
Completed Technology Project (2014 - 2014)

Project Introduction

Future human spacecraft will venture far beyond the relatively benign environment of low Earth orbit. They will transit through the deep space, but they may encounter warm transient environments such as low lunar orbit. Some spacecraft elements may be launched untended and would operate at relatively low power levels as they transit to their final destination. The combination of extreme environments and high turndown capability will be a major challenge for spacecraft thermal control systems. Thermal switches are among the thermal control devices that are required and can dissipate a wide range of heat loads in widely varying environments while using fewer of the limited spacecraft mass, volume and power resources. This SBIR project proposed by ACT will develop a low mass and high conduction ratio two-phase thermal switch as a thermal control system component for human spacecraft. The proposed device could work in thermal switch regime or in variable conductance regime while the set point can be changed remotely. A trade study will be conducted to define the three features of the low mass two-phase thermal switch and demonstrate the feasability of the concept. A preliminary full scale prototype will be designed, fabricated and tested at the end of the Phase I program.

Primary U.S. Work Locations and Key Partners





Low Mass, Two-Phase Thermal Switch Project Image

Table of Contents

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
Advanced Cooling Technologies, Inc.	Lead Organization	Industry	Lancaster, Pennsylvania
Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Pennsylvania

Project Transitions

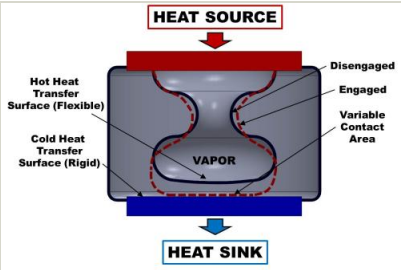
June 2014: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137732)*

Images



Project Image
Low Mass, Two-Phase Thermal Switch Project Image *(https://techport.nasa.gov/image/132556)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Advanced Cooling Technologies, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

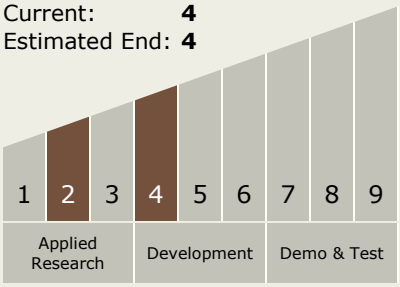
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Calin Tarau

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.2 Thermal Control Components and Systems
    - TX14.2.2 Heat Transport

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System